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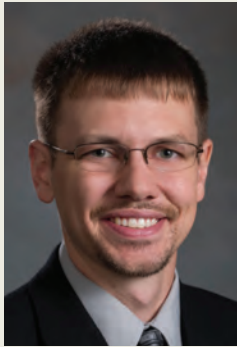
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MEET THE FACULTY

Derek M. Heeren, Ph.D., P.E.

Heeren joined the faculty at the University of Nebraska–Lincoln in August 2012, as an irrigation engineer and assistant professor with a 60 percent research and 40 percent teaching appointment. He is housed in UNL's Biological Systems Engineering Department and was part of a University of Nebraska Robert B. Daugherty Water for Food Institute (WFI) cluster hire. NU's WFI is a research, policy analysis and education institute committed to helping the world efficiently use its limited freshwater resources, with a particular focus on ensuring the food supply for current and future generations, according to the WFI web site at waterforfood.nebraska.edu.



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Water Current

PART OF THE ROBERT B. DAUGHERTY
WATER FOR FOOD INSTITUTE

Winter Storm Cancels January WRAP Meeting

A winter storm that blanketed Lincoln with nearly six inches of snow forced cancellation of a scheduled Jan. 30 meeting of the University of Nebraska's Water Resources Advisory Panel (WRAP).

"The storm promised to make travel challenging at best, so the meeting and the following morning's debrief breakfast were cancelled in the interests of safety," said

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Two Interview for
Nebraska Water Center Directorship

Two candidates were interviewed in January for the position of permanent director of the Nebraska Water Center, part of the Robert B. Daugherty Water for Food Institute.

The two candidates interviewed were:
Richard C. Peralta, Professor,
Groundwater Management and Irriga-

tion Management, Department of Civil and Environmental Engineering, Utah State University. Peralta interviewed January 22-23.

Chittaranjan Ray, Interim Director, Water Resources Research Center and Environmental Center, University of Hawaii and Chief Environmental Engineer, Applied

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UNL Scientist Cites Managing Risks
in New Keystone XL Pipeline Route

By Steve Ress, Nebraska Water Center

Potential groundwater contamination risks posed by the Keystone XL pipeline in Nebraska are minimal and manageable under a "risk-managed" route proposed by a University of Nebraska–Lincoln water scientist.

Roy Spalding, hydrochemist and water quality expert, and Aaron Hirsh, graduate student, outlined the findings in a journal article about risk-managed approaches to routing petroleum pipelines. The article is in the Dec. 4 issue of *Environmental Science*

and Technology, a long-standing and highly regarded journal published by the American Chemical Society, based in Washington, D.C.

The risk-managed route the authors propose for the Keystone XL pipeline in Nebraska "avoids the sensitive, highly vulnerable, agriculturally undeveloped land that elicited strong condemnation of the since-rejected original Keystone XL route," Spalding said.

Their proposed southeasterly route through Holt, Antelope and Pierce counties,

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Interim Director
Suat Irmak Ph.D.

*Director of Laboratory Services,
Water Sciences Laboratory*
Daniel D. Snow, Ph.D.

Editor
Steven W. Ress

Designer
Renee J. Lanik, UNL CIT

Layout
Anne M. Moore, UNL CIT

Nebraska Water Center
Robert B. Daugherty Water for
Food Institute
University of Nebraska
516 Hardin Hall
Lincoln, NE 68583-0979
Phone: (402) 472-3305
Fax: (402) 472-3610
E-mail: sress1@unl.edu



<http://watercenter.unl.edu>



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From the Interim Director Suat Irmak

Interviewing Permanent Director Candidates, Looking Ahead to Activities

It's difficult to believe that we are now well into the new year and an exciting new spring semester on the University of Nebraska-Lincoln campus.

Much has transpired since the last issue of the *Water Current* and much more lies ahead as another winter quickly turns to spring.

As most of you are aware, I have been honored to be one of two interim directors for the Nebraska Water Center since the center's last permanent director, my good friend and colleague Kyle Hoagland, stepped down in September 2009. Since that time, first Bruce Dvorak (who was selected as Chair of the UNL Department of Civil Engineering late in 2011) and then I have been leading the Nebraska Water Center as it has transitioned into becoming a key part of the Robert B. Daugherty Water for Food Institute.

It appears that the center may soon have a new permanent director, since we kicked-off the New Year helping to host visits and interviews with two candidates for the position in late January.

The first of these was Richard C. Peralta, a groundwater management specialist at Utah State University, who interviewed on January 22 and 23.

The second was Chittaranjan Ray, interim director of the Water Resources Research Center and Environmental Center at the University of Hawaii and chief environmental engineer, U.S. Navy Applied Research Laboratory, University of Hawaii. He interviewed on January 28 and 29.

The Nebraska Water Center staff had very meaningful exchanges with both candidates and we were pleased with the level of interest and attendance at the two candidate's presentations on campus.

We sincerely thank Linda Arnold, in the Institute of Agriculture and Natural Resources Vice Chancellor's office for her superb planning and coordination efforts for these two successful visits.



At this point, it is too early to tell how the director candidate interview and possible hiring process will proceed. We will keep you up-to-date on this process on our web site as the process unfolds.

Planning is progressing on the Summer Water and Natural Resources Tour and we hope additional tour details and registration materials will be ready to publish in the next six to eight weeks. The tour will be on June 25-27 and will be keyed primarily toward present and future management of surface and groundwater resources in Nebraska and the Great Plains. It appears most likely that the tour will begin and end at UNL's East Campus in Lincoln and tour length will most likely be two to two and a half days.

The tour coordinating committee made its first scouting and set-up pre-tour in early February and they have been busy contacting potential speakers and sponsors and examining potential stops and points of interest.

We thank those who contacted Steve Ress here at the Water Center to offer assistance or suggest topics, speakers and points of interest. I express my personal appreciation to Steve for

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MEET THE FACULTY

Derek M. Heeren, Ph.D., P.E. *continued from page 1*

Heeren obtained his Ph.D. while a research engineer in the Biosystems and Agricultural Engineering Department at Oklahoma State University. His areas of research include deficit irrigation modeling, subsurface nutrient transport, streambank erosion and groundwater-surface water interaction. His accomplishments include a prestigious U.S. Environmental Protection Agency STAR Graduate Fellowship, the New Faces of Engineering recognition by the American Society of Agricultural and Biological Engineers, and being author or co-author on 12 refereed journal articles.

Education:

Ph.D., Biosystems Engineering, Oklahoma State University, 2012
M.S., Agricultural Engineering, South Dakota State University, 2008
B.S., Agricultural and Biosystems Engineering, South Dakota State University, 2004 (Summa Cum Laude)

Examples of Current Research:

Irrigation scheduling
Irrigation in developing countries
Subsurface nutrient transport
Streambank erosion

Examples of Past Research:

Deficit irrigation modeling
Subsurface nutrient transport
Streambank erosion
Groundwater surface water interaction

Teaching Responsibilities:

Soil Conservation and Watershed Management (undergraduate level)
Advanced Irrigation Management (graduate level)

Selected Publications:

- Heeren, D. M., A. R. Mittelstet, G. A. Fox, D. E. Storm, A. T. Al-Madhhachi, T. L. Midgley, A. F. Stringer, K. B. Stunkel, and R. D. Tejral. 2012. Using rapid geomorphic assessments to assess streambank stability in Oklahoma Ozark streams. *Transactions of the ASABE* 55(3): 957-968.
- Midgley, T. L., G. A. Fox, and D. M. Heeren. 2012. Evaluation of the Bank Stability and Toe Erosion Model (BSTEM) for predicting lateral retreat on composite streambanks. *Geomorphology* 145-146: 107-114, doi: 10.1016/j.geomorph.2011.12.044.
- Heeren, D. M., G. A. Fox, R. B. Miller, D. E. Storm, A. R. Mittelstet, A. K. Fox, C. J. Penn, and T. Halihan. 2011. Stage-dependent transient storage of phosphorus in alluvial floodplains. *Hydrological Processes* 25(20): 3230-3243, doi: 10.1002/hyp.8054.
- Miller, R. B., D. M. Heeren, G. A. Fox, D. E. Storm, and T. Halihan. 2011. Design and application of a direct-push vadose zone gravel permeameter. *Ground Water* 49(6): 920-925, doi: 10.1111/j.1745-6584.2010.00796.x.
- Heeren, D. M., T. P. Trooien, H. D. Werner, and N. L. Klocke. 2011. Development of deficit irrigation strategies for corn using a yield ratio model. *Applied Engineering in Agriculture* 27(4): 605-614.
- Mittelstet, A. R., D. M. Heeren, D. E. Storm, G. A. Fox, M. J. White, and R. B. Miller. 2011. Comparison of subsurface and surface runoff phosphorus transport rates in alluvial floodplains. *Agriculture, Ecosystems and Environment* 141: 417-425.
- Fox, G. A., D. M. Heeren, and M. A. Kizer. 2011. Evaluation of a stream-aquifer analysis test for deriving reach-scale streambed conductance. *Transactions of the ASABE* 54(2): 473-479.
- Heeren, D. M., R. B. Miller, G. A. Fox, D. E. Storm, T. Halihan, and C. J. Penn. 2010. Preferential flow effects on subsurface contaminant transport in alluvial floodplains. *Transactions of the ASABE* 53(1): 127-136.
- E-mail / Web addresses:**
derek.heeren@unl.edu
<http://bse.unl.edu/web/bse/dheeren1>

Expect More Impacts as Nebraska Drought Rolls into Second Year

Nebraska was at the epicenter of the drought of 2012, and its impacts will intensify if it lasts through the winter, as is forecast, say climatologists at the University of Nebraska–Lincoln's National Drought Mitigation Center.

"The previous five years all had above-normal precipitation, the wettest period in recorded history," said Michael J. Hayes, the center's director. "For Nebraska, it was unprecedented. We came into 2012 with a full hydrological system – rivers, streams, reservoirs and groundwater. When you're talking major droughts, this is not a multi-

year drought. As we look ahead to 2013, we don't have that margin built into our hydrological system, so we're in pretty dire straits."

Nebraska, Colorado and Wyoming are all on track to record their driest year on record in 2012, Hayes said, and the country as a whole is having its hottest year on record.

The Climate Prediction Center says the drought in the Plains is likely to continue at least through February, and recovery will take time.

"In Nebraska and the central Plains, we've started seeing the

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The Nebraska Water Resources Association

By Amy Prenda, Executive Director, Nebraska Water Resources Association

The Nebraska Water Resources Association (NWRA) is a nonprofit alliance of state organizations and individuals dedicated to appropriate management, conservation, and use of water and land resources on a statewide and national level.

NWRA was founded in 1944 to further development, reclamation, conservation and beneficial uses of Nebraska's water and land resources, and its mission is to be a leader in Nebraska water. Directed by a 24 member board of directors representing Nebraska's river basins, surface water and groundwater irrigation, electric power, municipalities, industrial, professional, conservation, recreation and financial institutions, NWRA provides a diverse but unified voice to government policy makers and the public on water issues.

History

Initially known as the Nebraska Reclamation Association, NWRA came into existence to settle a dispute between the Central Nebraska Public Power and Irrigation District and a group of concerned water users. The association continued to foster cooperation among water users as it dealt with many intra-state water issues, including promoting public power development, major flood control works and watershed programs and projects, and was also active in inter-state water issues through its affiliation with the National Water Resources Association then known as the National Reclamation Association.

By the 1970's, Nebraska had seen many post-World War II water projects completed and the association turned its attention toward municipal water needs—both the projects and use associated with groundwater and surface water resources. It was also during this time that water projects became vulnerable by environmental and endangered species protection laws passed by Congress in the late 1960's and early 1970's.

In 1972, the Nebraska Reclamation Association followed the lead of the national association and changed its name to the Nebraska Water Resources Association to better reflect the expanded water interests of the association.

NWRA also expanded membership to accommodate for broadening interests and increasing pressure being put upon water development. Such membership included manufacturing industries, businesses and agribusinesses that encouraged the expansion of irrigation in the state.

As a result, in 1976, NWRA became a full-time association. In the late 1970's and early 1980's, NWRA began to focus on the declining quality and quantity of groundwater resources. As major interested shifted to groundwater and individual irrigators' water rights and

uses, public power districts were involved in rehabilitating projects and contract renewals in addition to relicensing water rights because of environmental laws and programs.

While still supporting multiple purpose water projects and water development, NWRA began to also focus on defending water issues.

National Affiliation

The Nebraska Water Resources Association is an affiliate member of the National Water Resources Association. While the National Water Resources Association origin goes back to the 1890s, it was originally established as the National Reclamation Association on December 6, 1932 at the State Capitol in Salt Lake City, Utah to promote federal financing for the construction of water reclamation projects throughout the West. At that time Reclamation was at its lowest, and many were fearful that without the united efforts of the western states, the entire reclamation program would be lost.

As the construction of major reclamation projects slowed in the late 1960's, the National Reclamation Association's future mission lacked focus and direction. The National Reclamation Association's members were increasingly becoming more concerned with water policy issues relating to water quality, acreage limitation, environmental protection, national water policy proposals and water rights disputes than in a myopic agenda focused solely on new development. A majority of the leadership of the National Reclamation Association felt it was time to project a more national perspective on water policy and development, focusing more on water resources development so in 1969 the National Reclamation Association became the National Water Resources Association.

Today, the National Water Resources Association is a strong federation of state associations and caucuses representing a broad spectrum of water supply interests. It is the oldest and most active national association concerned with water resources policy and development.

Its strength is a reflection of the tremendous "grassroots" participation it has generated on virtually every national issue affecting western water conservation, management, and development.

Vision

In the early 1990's NWRA goals were to: protect state water rights and existing irrigation and other water uses; promote development of supplement water supplies to ensure future availability of water for all needs; to conserve water by management; to strengthen the agricul-

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Free Public Water Lectures Continue Through April

The University of Nebraska's spring semester water seminar series, that began its annual weekly run in January, continues through April with the public encouraged to attend any or all lectures they choose.

The free public lectures continue weekly through April 24 and are each Wednesday afternoon from 3:30 to 4:30 p.m. in the first floor auditorium of Hardin Hall, northeast corner of N. 33rd and Holdrege Sts, University of Nebraska–Lincoln East Campus, Lincoln. During that time, the only Wednesday a seminar will not be held is March 20, when UNL students are on spring break.

Weekly topics include a variety of timely and provocative water and water-related subjects. They are organized and presented by the Nebraska Water Center, which is part of NU's Daugherty Water for Food Institute.

Among the remaining lectures, Megan Mullin of Temple University will lecture on the new local politics of water on Feb. 20 and Ahjond Garmestani of the U.S. Environmental Protection Agency will talk on adaptive governance of urban watersheds on March 6. David Strayer of the Cary Institute of Ecosystem Studies will speak on the effects of the Zebra Mussel invasion on aquatic ecosystems in the Hudson River and other locales on March 13 and on April 10 Jeremy

Weiss of the University of Arizona will address the ramifications of recent variations in low temperature and moisture constraints on vegetation in the southwestern U.S.

Later in April, Steven Peterson of the U.S. Geological Survey will address the High Plains groundwater availability study and how abundant groundwater in the High Plains aquifer region doesn't necessarily mean abundant surface water.

The complete lecture schedule is online at watercenter.unl.edu. Videos of most lectures, along with speaker PowerPoint presentations, will also be posted at that web address within a few days after the lecture is presented.

Remaining lectures:

Feb. 20: The New Local Politics of Water — Megan Mullin, Temple University

Feb. 27: Resistance and Resilience of Aquatic Communities to Low Flow Disturbance — Annika Walters, University of Wyoming

March 6: Adaptive Governance of Urban Watersheds — Ahjond Garmestani, U.S. Environmental Protection Agency

March 13: Effects of the Zebra Mussel Invasion on Aquatic Ecosystems: the Hudson River and Beyond — David

Strayer, Cary Institute of Ecosystem Studies

March 20: No Seminar (UNL Spring Break)

March 27: Dynamics of Transport and Fate of Solutes in Hydrologic Landscapes — Adam Ward, University of Iowa

April 3: (Williams Memorial Lecture) Implications for Water, Food and Energy from the Latest IPCC Climate Simulations — Lawrence Buja, National Center for Atmospheric Research

April 10: Recent Variations in Low-Temperature and Moisture Constraints on Vegetation in the Southwestern U.S. — Jeremy Weiss, University of Arizona

April 17: The U.S. Drought of 2012: Once-in-a-Generation Crop Calamity — Brad Rippey, U.S. Department of Agriculture

April 24: The High Plains Groundwater Availability Study: Abundant Groundwater Doesn't Necessarily Mean Abundant Surface Water — Steven Peterson, U.S. Geological Survey

2013 Water and Natural Resources Tour Is June 25-27: Managing Nebraska's Water Resources

June 25-27, 2013 are the tentative dates for the 2013 Water and Natural Resources tour jointly conducted and sponsored by the University of Nebraska's Nebraska Water Center, the Kearney Area Chamber of Commerce, and Central Nebraska Public Power and Irrigation District.

The Nebraska Water Center (NWC) is part of NU's Robert B. Daugherty Water for Food Institute.

This year's tour, like many before it, was held over three days in July. Next year's dates have been moved up about three weeks, into late June, to take advantage of the probability of cooler temperatures.

"We've held the tour in June in past years and we're hoping it's a better alternative in terms of cooler weather. Temperatures for this year's tour in July were pretty brutal on everyone," tour co-organizer Steve Ress of the NWC said.

The 2013 tour will stay in Nebraska, where it will examine the present and future management of surface and groundwater resources.

"In terms of current and future demands and with the impacts of this year's drought fresh in everyone's minds, we thought the time was right to revisit these topics," Ress said.

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Climate Masters of Nebraska Creating Informed Activists

By Kelly Helm-Smith, National Drought Mitigation Center, UNL

Public volunteers taking the University of Nebraska–Lincoln's Climate Masters of Nebraska course early this year will learn how they can work to help reduce climate change. Besides the basics of climate change, class sessions will focus on home energy, green building, renewables, transportation, water conservation and drought, consumption and waste, and yards and food, with field trips to the Bluff Road Landfill, near Lincoln and to EcoStores Nebraska.

Tonya Bernadt, an education and outreach specialist at UNL's National Drought Mitigation Center, coordinates Climate Masters in cooperation with Natalie Umphlett, a regional climatologist at UNL's High Plains Regional Climate Center, and Tapan Pathak, UNL climate extension educator. All three are based in UNL's School of Natural Resources.

After completing the free course, taught by a variety of experts from the Lincoln community, volunteers will provide 30 hours of climate education in community settings of their choosing, Bernadt said.

For example, after the first Climate Masters course in Lincoln last year, participants formed a local chapter of the Climate Citizens Lobby and regularly sponsor educational events.

Opportunities for this year's participants include doing home consultations, waste assessments for businesses, facilitating discussions on choices related to sustainable living and other creative activities that the volunteers decide to do.

Climate Masters is made possible by a grant from the U.S. Environmental Protection Agency. Cleaner Greener Lincoln is a local partner.

For more information on the program and upcoming course availability, go online to climatemasters.unl.edu.



At community events such as an Earth Day celebration, the 2012 Climate Masters of Nebraska participants provided information on individual actions to reduce greenhouse gas emissions.



Last year's climate masters course participants toured a local organic farm.



A landfill tour gave the climate masters class an up-close view of where waste goes.



Drought Webinar Series

A spring webinar series provides drought planning techniques and technologies to advisors seeking to help Great Plains ranchers manage through drought. The webinars are January through May, on the last Wednesday of each month.

Each one-hour webinar starts at 10 a.m. (CT) with a briefing on current drought status and what to expect in the foreseeable future, followed by a session on a specific technique related to drought planning, and question-and-answer time. The webinars will be led by ranchers and advisors with hands-on experience in drought planning and range management.

Jerry Volesky, UNL Extension range and forage specialist at the West Central Research and Extension Center, North Platte, will introduce the series by talking about why ranchers need drought plans.

Remaining topics and presenters:

Feb. 27: Avoiding Analysis Paralysis: Monitoring and Setting Critical Dates for Decision Making During Drought, by Dwayne Rice, rangeland management specialist, NRCS, Kansas; Ted Alexander, owner of Alexander Ranch in south-central Kansas; and Cal Adams, owner of Adams Ranch in north-central Kansas.

March 27: The New Cumulative Forage Reduction (CFR) Index: for Assessing Drought Impacts and Planning a Grazing Strategy, by Pat Reece, owner and senior consultant of Prairie Montane Enterprises and professor emeritus of the University of Nebraska–Lincoln.

April 24: Using a Drought Calculator to Assist Stocking Decisions, Stan Boltz, state range management specialist, NRCS, South Dakota and Jeff Printz, rangeland

management specialist, NRCS, North Dakota.

May 29: Economic Factors to Weigh in Making Decisions during Drought, by Matt Stockton, agricultural economist at the West Central Research and Extension Center in North Platte.

Sessions are free and to the public. Registration is required to receive the Adobe Connect webinar link. To register, go to Managing Drought Risks.

More information can be found at the Managing Drought Risk on the Ranch website or contact Tonya Haigh, National Drought Mitigation Center, thaigh2@unl.edu, (402) 472-6781.

2013 Tour *continued from page 5*

“The tour will encompass several watersheds and Natural Resource Districts, though we have not completely fleshed-out a tentative route, speakers or topics yet. We currently envision one overnight in the Columbus area and one overnight in either the Kearney or Alma areas.”

“The tour’s organizing committee met in late September and have some initial thoughts about possible stops, topics, speakers and co-sponsors for the coming tour, but no definite itinerary yet.”

Co-organizers made the initial tour planning and set-up trip in early February and plan a follow-on trip in March or April.

“If you would like to help co-sponsor the tour, or have ideas for speakers or topics in the Lincoln, Columbus, Kearney or Alma areas, send an email to sress1@unl.edu and let me know,” Ressa said.

Longer term planning is to possibly take the tour out of state in 2014 or 2015 with organizers discussing possibilities in Idaho, Oregon, Tennessee and other locations.

Tour organizers are Ressa, Jeff Buettner of Central Nebraska Public Power and Irrigation District, Jennie Nollette of the Kearney Area Chamber of Commerce and retired UNL senior lecturer Mike Jess, who also hosts the tour.



Read us on your
iPhone or Android.

February Planning Trip for the June Water and Natural Resources Tour:

Present and Future Management of Surface & Groundwater Resources

Unique artwork in the Union Plaza area of the Antelope Valley Project in Lincoln. The largest public works project in Lincoln's history is jointly sponsored by the city, the University of Nebraska–Lincoln and the Lower Platte South NRD.

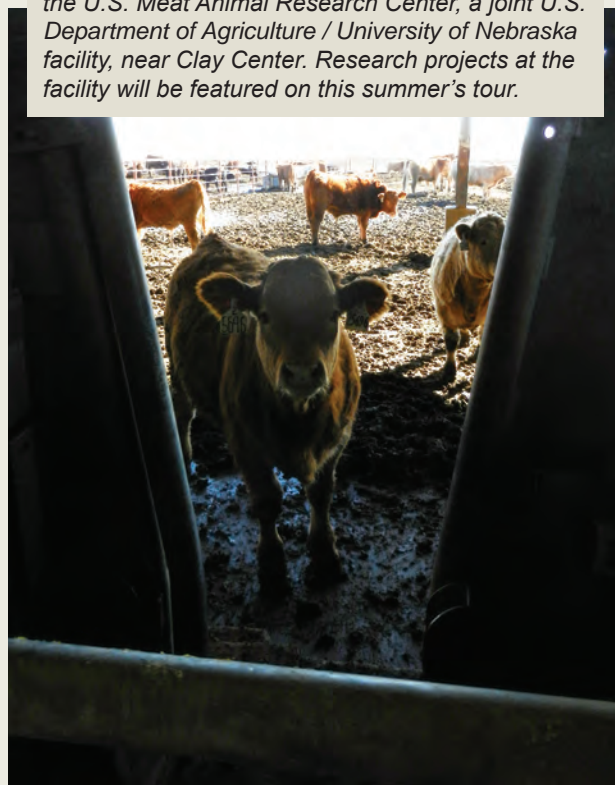


Tour planners look over recently completed Union Plaza area features of the Antelope Valley Project in Lincoln. The \$238,000,000 project is designed for flood control, economic development, transportation and community revitalization.

Calves in one of many controlled feedlots at the U.S. Meat Animal Research Center near Clay Center. The center began with the transfer of former military ordinance plant grounds to the U.S. Department of Agriculture in the 1950's and is now one of the largest USDA animal research facilities in the country.



Calves line-up at computer operated feed bunks at the U.S. Meat Animal Research Center, a joint U.S. Department of Agriculture / University of Nebraska facility, near Clay Center. Research projects at the facility will be featured on this summer's tour.





Mountains of dredged sand from the Loup Canal are now mined by Preferred Sands of Genoa for use in the fracking industry in North Dakota and other locations.

Loup Public Power District electric generating plant on the Loup Canal near Monroe. The plant was built as a WPA project in the early 1930's and went online in 1937, one of many projects to both irrigate and electrify rural Nebraska during the Great Depression.



Tour organizers tour facilities at the Spring Creek Prairie Audubon Center near Denton.



A coyote in the Spring Creek visitor center looks-out over native grasslands at the Audubon Center near Denton.



Spring Creek Prairie Director Kristofer Johnson and Mike Jess talk at the Audubon Center near Denton.

(photos by Steve Ress, Nebraska Water Center)

Keystone Pipeline *continued from page 1*

to the existing north-south Keystone 1 pipeline, avoids the Ogallala aquifer beneath the fragile and pristine Sandhills, sub-irrigated meadows and areas with very shallow water tables. The risk-managed route through these three counties is through overlying row-cropped land underlain by already contaminated Ogallala groundwater to the Keystone 1 corridor.

The north-south segment paralleling the Keystone corridor to Steele City avoids the Ogallala aquifer.

The proposed risk-managed pipeline route, in the Holt, Antelope and Pierce county areas, is essentially the same length as the recently proposed KXL route under consideration but runs slightly south of it and avoids shallow groundwater. Once east of Pierce County, the risk-managed route drops almost due south, paralleling the Keystone One mainline pipeline.

Spalding, of UNL's agronomy and horticulture department, and Hirsh, from the civil engineering department, point out that in Nebraska, where 85 percent of the population uses groundwater for its drinking water source, "threats to water quality are taken quite seriously" and that the routing of petroleum pipelines could be "made much more acceptable by adopting risk-managed routes that

lessen the potential to adversely impact high-quality groundwater and, should a release occur, decrease the longevity and potential detrimental effects of hazardous groundwater contaminants."

The article goes on to note that while pipeline spills have been dramatically reduced over the last 10 years, averaging fewer than one per 1,000 miles of pipeline over that period, "releases of hazardous petroleum chemicals to groundwater do occur and some should be expected."

The potential risk of releases from the Keystone XL pipeline, or from any pipeline used to transport tar-sands oil, may increase from liquefying the asphalt-like tar sands with refinery condensate or naphtha to form a more readily flowing mix of oil and diluents known in the oil industry as "dilbit."

Little is known about the potential movement of dilbit to groundwater at release sites, the authors wrote. There are so many variables including the chemical composition of the dilbit, ambient temperature, depth to groundwater, emergency cleanup practices and other factors, that predicting the exact mechanism of contaminant movement to the aquifer is complicated, Spalding and Hirsh's article reports.

One of the best ways to minimize risks from a potential spill is to carefully select a pipeline route with minimal environmental risk and reasonable length, which the researchers have done with their newly proposed pipeline route.

The southeasterly course through intensely spray-irrigated, row-cropped land underlain by contaminated groundwater in Holt, Antelope and Pierce counties is "an opportunistic use of impaired groundwater and existing irrigation practices to remediate volatile petroleum contaminants and groundwater should a spill occur."

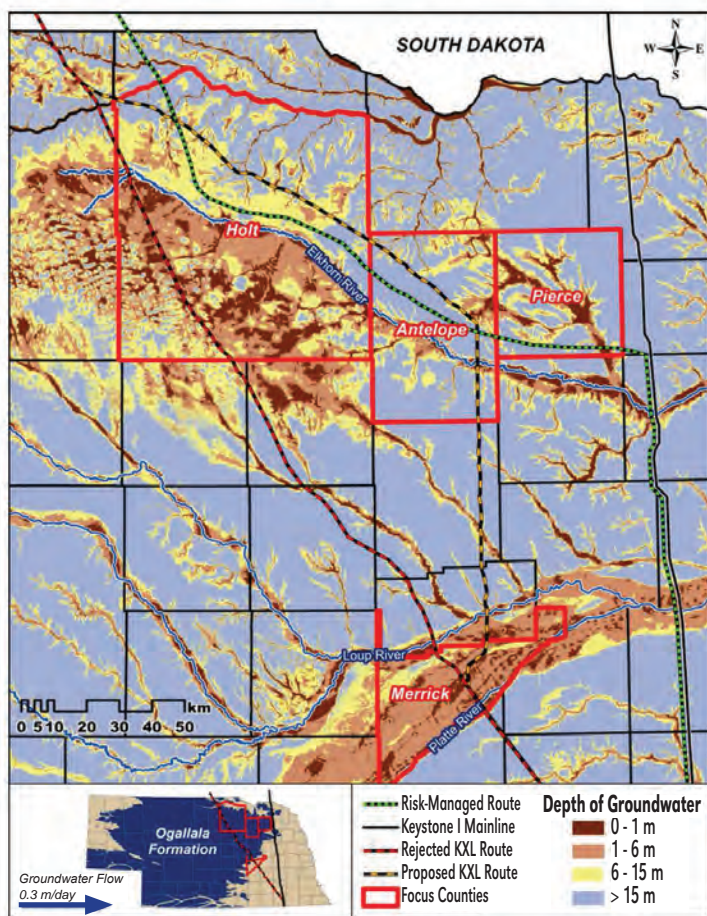
Their proposed route also avoids high quality Ogallala aquifer groundwater, as well as bottomland, high water table land and major river crossings, the authors say.

"Most importantly, the risk-managed approach is founded on the paradigm that siting the pipeline through an intensively spray-irrigated area overlain by a contaminated aquifer provides (for) both in place and off site remediation (of a spill). Thus, routing through areas of intense spray irrigation (center pivots) is by design."

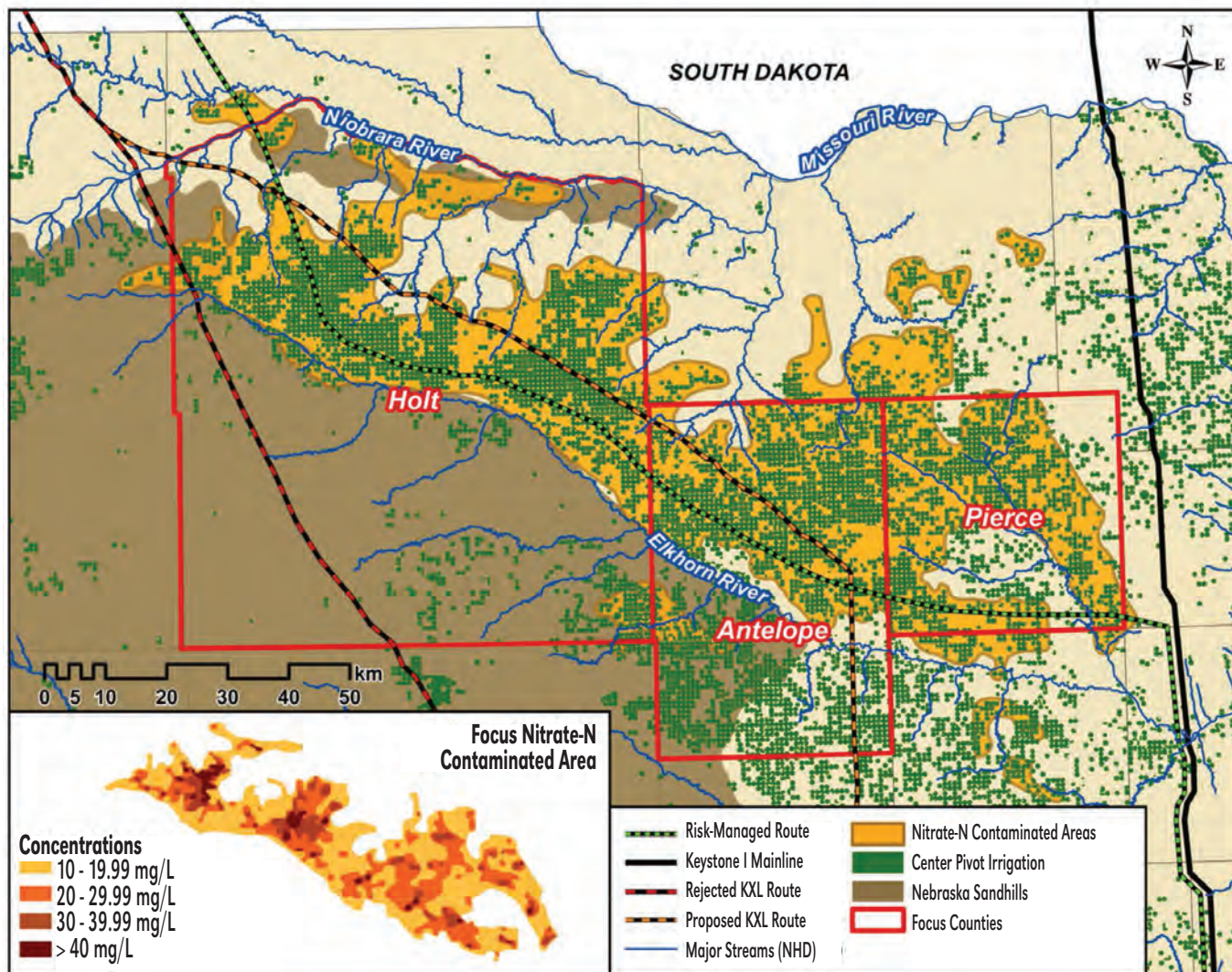
Earlier research by Spalding has proven that many volatile hazardous compounds found in petroleum products, such as the benzene present in dilbit, can be stripped from the contaminated water by spraying it through a center pivot, where the compounds can then dissipate harmlessly as a gas into the atmosphere, making groundwater irrigation by center pivot along the proposed pipeline route a potential plus.

"Groundwater capture zones" created by wells pumping water to center pivots would also help contain and remove dissolved contaminants, Spalding said.

The majority of underlying groundwater in or near the proposed



Depth to groundwater and pipeline routes overlying the controversial areas in Nebraska. The pipeline routes are scaled to represent a one kilometer wide corridor.



Location of nitrate-N contaminated groundwater areas and spray-irrigation systems potentially impacting petroleum hydrocarbon remediation in northeastern Nebraska. The pipeline routes are scaled to represent a one kilometer wide corridor.

Keystone XL pipeline route is heavily laced with nitrate and sulfate contamination from fertilizer and soil amendments that have leached into the groundwater from the intensively farmed area, a not uncommon occurrence where crops are extensively irrigated.

This nitrate contamination stretches for over 100 miles and over 1 million acres are underlain by non-potable high nitrate Ogallala groundwater. Leached soil amendments enhance the degradation of hazardous petroleum compounds in groundwater, which is another plus to the article's proposed route if a release should occur, the authors say.

"Most agriculturally based states have extensive areas with groundwater nitrate contamination similar to that in the three-county focus area (of the proposed pipeline). Where appropriate, these contaminated areas deserve consideration in siting future routes for conveying liquid fuels," Spalding and Hirsh said.

The Keystone XL pipeline is awaiting U.S. State Department action on an international permit to build the pipeline. Earlier this year, the route proposed by the Nebraska Department of Environmental Quality was submitted as the new route currently being considered by the State Department and the White House.

Winter Storm continued from page 1

Rachael Herpel, education and engagement coordinator for the Water Center and Robert B. Daugherty Water for Food Institute, who coordinates the diverse, 13-member WRAP.

Herpel and other WRAP conveners conferred the afternoon of Jan. 31 to determine what the next steps for the panel would be and when the next WRAP meeting would be scheduled.

"Many members of the panel have already shared issues and

opportunities they see on the horizon and we are reviewing those. We welcome panel member perspectives and feedback at any time," she said.

WRAP, which typically meets three times a year, last met Oct. 5, 2012.

Panelists will be advised by email when WRAP next expects to meet.

Water Center Directorship *continued from page 1*

Research Laboratory at the University of Hawaii (U.S. Navy). Ray interviewed January 28-29.

Candidates presented a seminar on the first day of their interview to discuss the topic "Growing the Nebraska Water Center to 2020 — and Beyond." The seminars were held at the Nebraska East Union and were web cast.

Candidates selected to interview were chosen by a search advisory committee chaired by Thomas Franti, associate professor, UNL Department of Biological Systems Engineering. Committee members included Shannon Bartelt-Hunt, associate professor, UNL Department of Civil Engineering; Mark Brohman, executive director, Nebraska Environmental Trust; Lilyan Fulginiti, professor, UNL Department of Agricultural Economics; John Gates, Harold and

Esther Edgerton assistant professor, UNL Department of Earth and Atmospheric Sciences; and Alan Kolok, professor, Department of Biology, University of Nebraska, Omaha, and courtesy professor, UNL School of Natural Resources.

Kyle Hoagland, professor in the UNL School Resources, stepped down as permanent director of the Nebraska Water Center in September 2009. Since then, the Center has had three interim directors: Bruce Dvorak, professor and now Chair of the UNL Department of Civil Engineering; Mark Kuzila, professor, state geologist and head of UNL's Conservation and Survey Division; and presently, Suat Irmak, professor in UNL's Department of Biological Systems Engineering.

From the Interim Director *continued from page 2*

helping to coordinate, organize and execute such a nice program for so many years.

We unfortunately had to cancel a planned Jan. 30 meeting of the Water Resources Advisory Panel (WRAP) due to a severe winter storm that dumped about six inches of snow on the Lincoln area the night before the meeting. In the name of safety, particularly for WRAP members traveling into Lincoln from out of town, we thought the best thing to do was cancel the meeting and reschedule it at a later date.

Rachael Herpel, our education and outreach specialist who coordinates this important group for the Water Center, will notify members when the next WRAP meeting will be scheduled.

We appreciate panel members, or any of our constituents or members of the public, contacting us at any time to share perspectives, issues, ideas or feedback with us, however.

Our assistant director, Lorrie Benson, has been working on setting the dates, venue and agenda for the Fall 2013 water law

conference and water seminar since the day after the 2012 events concluded and has made good progress toward crafting these back-to-back one-day events in October.

The Fall science and policy symposium will be Oct. 15, where we anticipate focusing on a range of climate and drought issues that remain so much on everyone's minds. The following day, Oct. 16, the water law conference will continue its tradition of offering practice-oriented topics designed to be of use to practicing attorneys, of use and interest to anyone dealing with water-based issues. Continuing legal credits (CLEs) will again be available to our attending attorneys.

Both these events will be at Lincoln's Cornhusker Hotel.

We ask for and appreciate any suggestions for speakers and topics for these two events that you may have. Your suggestions can be phoned or emailed to Lorrie Benson at (402) 472-7372 or lbenson2@unl.edu.

NWRA *continued from page 4*

tural base of Nebraska through irrigation development; and to expand the economy of Nebraska through agricultural development and food production, while considering fish and wildlife as well as recreational interests.

Today, NWRA's vision is to achieve a sustainable water supply for all interests in Nebraska. The NWRA vision is to also achieve this at a national level. NWRA appreciates that our existing water resources need to be used in an economical and environmentally responsible manner and this can only be done by asking it members to promote the following principles:

- Responsible environmental stewardship;
- Protection of public health and the environment;
- Use of sound science in water resource management;
- Reasonable economic benefits and costs for water projects;
- Advocate for public education regarding water resource issues; and
- Recognized leadership in addressing water issues.

NWRA has evolved as an association since its initial creation in 1944. However, since 1944 the NWRA has not strayed from its initial purpose to promote the position that Nebraska's water policy must balance the needs of people and the environment.

Nebraska Drought *continued from page 3*

drought feeding off itself, with the dry soils and dry air not allowing precipitation events to develop as usual,” said Brian Fuchs, drought center climatologist. “With the lack of moisture, we’re more like a desert environment. It warms up fairly quickly during the day, but drops quickly at night.”

State climatologist Al Dutcher recently said that the chances of getting a wet enough winter to bring moisture levels back to normal are only 10 to 20 percent.

“When we do have precipitation, very little will go to runoff,” Fuchs said. “Those soils are going to act as a big sponge. They’re just going to take in a lot of the moisture. We’ll continue to see problems of stock ponds, smaller lakes and streams dropping. The hydrologic drought hasn’t reared its head, but it’s there, as we are seeing more water systems under stress.”

“Typically when farmers are done irrigating, you will see the water in the Platte percolate back through the basin,” Fuchs said. “We did see that response but it was very minimal and that was even with the irrigation season ending sooner than usual. The channels are tiny, with these very small threads of water in eastern Nebraska.”

Anecdotal evidence suggests that in some areas, groundwater levels are declining, which could affect well owners. “I would see that exponentially increasing if we stay dry in 2013,” Hayes said.

“There’s a public health issue when homes don’t have water.” Although rural residents may be accustomed to hauling water occasionally, Hayes noted that it could be a real hardship for some, such as older people living alone.

Organizations that work with well owners recommend having wells checked now, especially if they were constructed before 1993, to ensure reliability of water supply.

Agricultural producers have been hit hard by the drought. The U.S. Department of Agriculture’s Risk Management Agency said that as of Dec. 10, indemnity payments nationwide had reached \$8 billion for 2012.

In 2012, 80 percent of the eligible acres nationwide and 90 to 95 percent in Nebraska enrolled in crop insurance, said Rebecca Davis, regional director for the RMA in Topeka, speaking at Nebraska’s Climate Assessment and Response Committee meeting Nov. 29.

She said that Nebraska is currently the fourth largest consumer of crop insurance, and the fifth largest recipient of indemnity payments, with nearly \$483 million paid out as of Nov. 19, and corn alone accounting for \$363.2 million of the covered loss. By Nov. 26, total Nebraska indemnities were at \$544 million, with \$502 million due to drought, heat and dry wind that affected more than 2 million acres of cropland.

This year’s drought is forcing producers to make hard choices. “The problem with drought and lack of forage is that many producers are using corn stalks as forage, actually baling them and selling them like hay, which is a double-edged sword,” Fuchs said. “While they are using the stalks for one purpose, it could be hurting them as far as tillage conditions.” Leaving stalks on the field as a cover that can prevent erosion and help hold moisture in the soil.

Nebraska had its worst fire season since 1919, with central and western Nebraska hardest-hit. Don Westover, fire program leader of the Nebraska Forest Service, reported that as of Dec. 14, the state had 1,426 wildfires reported, burning more than 400,752 acres and 65 structures, and costing \$12 million so far. He added that a few large fires still unreported in the official tally would add another 94,000 acres.

For up-to-date information from Nebraska Extension about how to prepare for another drought year, go to droughtresources.unl.edu.

Graduate Students *continued from page 16*

Where are some of those former WSL graduate students now? Several whom I have stayed in contact with are now in supervisory or management positions for environmental engineering firms working on site assessment or remediation projects around the globe. One particularly talented student is now a prominent supervisory soil scientist with the U.S. Department of Agriculture’s Agricultural Research Service and has been credited with nearly 100 research publications.

Several of our former international graduate students are faculty or research scientists in their home countries. Other former students are college professors or scientists here in the U.S. A few recent graduates are postdoctoral research associates exploring environmental careers in academics or industry. Each of these former graduate students is now finding their water science niche due in part to their experience and training in the WSL.

That’s a satisfying and motivating legacy.

The very fact this facility exists and continues to evolve in teaching and developing methodologies to keep it on the cutting edge of academic research laboratories very likely encouraged some of these students to enroll at the University of Nebraska. I often have faculty bring prospective students to the lab for tours.

The range of equipment together with the experience of our faculty and staff most definitely provided the opportunity to do cutting edge research not possible at most other colleges.

We understandably emphasize and promote the successes and accomplishments of our NU faculty in terms of discoveries, grants and publications. I have to believe these achievements can also be measured through the success of our graduate students who go on to become water scientists.

It is an honor and privilege to work with the faculty and their students to help ensure a future filled with well-trained scientists solving tomorrow’s water problems.

NEWS BRIEFS

AWWA Improves Website

The American Water Works Association has launched a new, streamlined website at awwa.org.

The enhanced design and improved functionality provides state-of-the-art browsing experiences for AWWA members, customers and visitors.

"We are thrilled to unveil a site that is both attractive and easy to use," said AWWA Executive Director David LaFrance. "AWWA has an incredible amount of knowledge to offer water professionals, and the new web site provides simple, intuitive access to it."

Updates include one-stop shopping for event registration, products and other purchases, an international event calendar, enhanced *Journal AWWA* and *Opflow* online publications, and easier access to knowledge about available volunteer opportunities.

There is an FAQ page available to answer basic questions about the new website. Users may also contact AWWA customer service at (800) 926-7337 for more information.

AWWA Symposium on Biological Drinking Water Treatment

The American Water Works Association has launched its newest event, the 2013 Biological Treatment Symposium, to be held March 28-29, in Denver, Colo. Symposium registration is now open.

The symposium will focus on biological drinking water treatment technology, operations, and monitoring strategies. The leading-edge symposium will dissect the benefits of engineered and passive biological systems from both the research and utility perspectives.

The technical program, developed by expert planning committee members, will address ways to meet current and future regulatory requirements while ensuring continued public health protection during implementation and operation. More than 30 technical sessions will cover high-interest topics ranging from research perception, performance and practice, microbiological aspects of biotreatment, membrane pretreatment, trace organics and much more.

Attendees are encouraged to register for the conference by Feb. 27 for discounted pricing. Additional information and registration details are available at awwa.org.

Kilic on Landsat 8 Team

Ayşe Kilic, a UNL faculty member at the School of Natural Resources and in the Department of Civil Engineering, will join an elite international team of 25 scientists supporting NASA's new Landsat Data Continuity Mission Satellite, "Landsat 8."

Kilic will serve a five-year term on the satellite project, using imagery and data to help track water in the air, in the ground and in plants.

"We need better tools, methods for sustaining our water resources and agricultural production under a changing climate," said Kilic, who was recently presented with an "Excellence in Research" award from the Agriculture Research Division of UNL's Institute of Agriculture and Natural Resources.

Now in its 40th year, the Landsat program is a series of Earth-observing satellite missions jointly managed by NASA and the U.S. Geological Survey. Since 1972, Landsat satellites have collected imagery of Earth's continents and surrounding coastal regions, enabling researchers to study the planet and to evaluate the dynamic changes caused by both natural processes and human practices.

Kilic and her UNL research team and students will further the development of algorithms and computer software to estimate water consumption from irrigated and natural vegetation over large land areas. Her work with Landsat 8 will focus on evapotranspiration—the process of water moving through the atmosphere as it evaporates from soil and water and transpires from plants. She will receive \$270,000 from the US Geological Survey to support her research activities related to Landsat Science Team membership.

Hayes Gets Omtvedt Award

Michael Hayes and the National Drought Mitigation Center were presented the "Omtvedt Innovation Award" in January in recognition of exceptional service at the University of Nebraska and the Institute of Agriculture and Natural Resources.

Hayes, NDMC director and School of Natural Resources faculty member, credited the award to "the team attitude" at the NDMC, which played a central role in national news stories as drought conditions gripped a vast portion of the U.S. this summer and fall.

In addition to consistent media exposure, NDMC featured prominently during the drought through its involvement in a variety of activities including the U.S. Drought Monitor product, producer-oriented workshops around the region, briefing members of Congress, and helping to organize a National Drought Forum in December in Washington, D.C.

The award was presented at an IANR All-Hands Meeting Jan. 17.

EPA Releases Update on Ongoing Hydraulic Fracturing Study

The U.S. Environmental Protection Agency (EPA) has updated its ongoing national study, currently underway, to better understand any potential impacts of hydraulic fracturing on drinking water resources.

Study results, which Congress requested EPA to complete, are expected to be released in a draft for public and peer review in 2014. The recent update outlines work currently underway, including the status of research projects that will inform the final study.

It is important to note that while this progress report outlines the framework for the final study, it does not draw conclusions about the potential impacts of hydraulic fracturing on drinking water resources, which will be made in the final study.

As the administration and EPA have made clear, natural gas has a central role to play in our energy future, and this important domestic fuel source has extensive economic, energy security, and environmental benefits.

The study EPA is currently undertaking is part of EPA's focus to ensure that as the administration continues to work to expand production of this domestic resource safely and responsibly.

Among the information released are updates on 18 research projects and details on the agency's research approach as well as next steps for these ongoing projects and analyses. This update follows public release, in November 2011, of the agency's final study plan, which underwent scientific peer review and public comment.

EPA has engaged stakeholders, including industry, to ensure that the study reflects current practices in hydraulic fracturing. EPA continues to request data and information from the public and stakeholders and has put out a formal request for information that can be accessed through the federal register at: <https://www.federalregister.gov/articles/2012/11/09/2012-27452/request-for-information-to-inform-hydraulic-fracturing-research-related-to-drinking-water-resources>

EPA also expects to release a draft report of results from the study in late 2014. The study has been designated a Highly Influential Scientific Assessment, meaning it will receive the highest level of peer review in accordance with EPA's peer review handbook before it is finalized.

The 2014 draft report will synthesize results from the ongoing projects together with the scientific literature to answer the study's main research questions. EPA's Science Advisory Board (SAB) is forming a panel of independent experts that will review and provide their individual input on the ongoing study to EPA.

The SAB will provide an opportunity for the public to offer comments for consideration by the individual panel members. For more information on the SAB process, please visit: <http://yosemite.epa.gov/sab/sabpeople.nsf/WebCommittees/BOARD>

For more information: www.epa.gov/hfstudy

EPA Updates Rule for Pathogens in Drinking Water, Sets Limit for *E. Coli*

EPA has updated the rule for pathogens in drinking water, including setting a limit for the bacteria *E. coli* to better protect public health.

The Revised Total Coliform Rule ensures that all of the approximately 155,000 public water systems in the United States, which provide drinking water to more than 310 million people, take steps to prevent exposure to pathogens like *E. coli*.

E. coli can cause a variety of illnesses with symptoms such as acute abdominal discomfort or, in more extreme cases, kidney failure or hepatitis. Under the revised rule, public drinking water systems are required to notify the public if a test exceeds the maximum contaminant level (MCL) for *E. coli* in drinking water.

If *E. coli* or other indications of drinking water contamination are detected above a certain level, drinking water facilities must assess the system and fix potential sources and pathways of contamination. High-risk drinking water systems with a history of non-compliance must perform more frequent monitoring.

The revised rule provides incentives for small drinking water systems that consistently meet certain measures of water quality and system performance. Public water systems and state and local agencies that oversee them must comply with the requirements of the Revised Total Coliform Rule beginning April 1, 2016.

Until then, public water systems and primacy agencies must continue to comply with the 1989 version of the rule. The Safe Drinking Water Act requires that EPA review each National Primary Drinking Water Regulation, such as the Total Coliform Rule, at least once every six years.

The outcome of the review of the 1989 Total Coliform Rule determined that there was an opportunity to reduce implementation burden and improve rule effectiveness while at the same time increasing public health protection against pathogens in the drinking water distribution systems.

EPA's revised rule incorporates recommendations from a federal advisory committee comprised of a broad range of stakeholders and considers public comments received during a public comment period held in fall 2010. For more information: <http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation.cfm>

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Future Water Scientists and the UNL Water Sciences Laboratory

By Daniel Snow, Director of Laboratory Services, UNL Water Sciences Laboratory

I recently attended a research grant proposal meeting and was visiting with a faculty colleague about a new project investigating the use of nanomembranes for water purification. The colleague had just recruited a new graduate student for this project and was confident in the student's ability to get the work done.

I acknowledged that a new graduate student can be a "mixed blessing" but I was sure they would have no problems getting the work done.

Of course, this comment brought knowing smiles from other faculty in the group, each sharing in the humor of the moment through their experience – both positive and negative – in working with graduate students.

On a more serious note, this conversation got me thinking about all the students now using our facility, plus those who have had part or all of their research supported through the University of Nebraska–Lincoln's Water Sciences Laboratory (WSL) over the last 22 years.

It has been, and continues to be, an honor and privilege to work with these students. They are our future....our up-and-coming water scientists. Helping train them is one of the charges specified in the "Water Resources Research Act of 1964," the Congressional legislation

that created the National Water Resource Institutes, as well as our parent and host of many years, the Nebraska Water Center (formerly the UNL Water Center).

Last year there were more students in the lab analyzing samples for their research than at any time I can recall. On average I would estimate we've had around three students per year working in the lab, but last year it was closer to eight. These students represent a broad cross-section of units and disciplines ranging from engineering to life sciences to chemistry and earth and atmospheric sciences to human health and toxicology. I'd like to think this makes the WSL a sort of melting pot of water scientists trained in a specific discipline, and using the expertise and equipment to become trained to solve tomorrow's water problems.

Most often, they are trained on an existing method, procedure or instrument by one of our staff. They also learn how to evaluate results, do calculations and measure data quality. Several have helped develop new methods that led to a publication or a new discovery. Each student brings unique skills, interests and challenges.

continued on page 13